06 January 2012

CRUISE RESULTS
NOAA Fisheries Research Vessel *Delaware II*
Cruise No. DE 11-10
Ecosystem Processes Research Cruise

CRUISE PERIOD AND AREA

The cruise period was 30 November to 08 December 2011. The NOAA fisheries research vessel *Delaware II* stopped to lower instruments over the side at 71 stations. Samples were collected in Georges Bank, Southern New England, and the western Gulf of Maine regions.

OBJECTIVES

The principal objective of this survey was to locate and quantify concentrations of larval and juvenile fish, with the target species of Atlantic herring (*Clupea harengus*). Samples were collected with a bongo net and a video plankton recorder (VPR) towed simultaneously, and an Isaacs-Kidd midwater trawl (IKMT).

Secondary cruise missions included:
1) Finish stations not completed during the November EcoMon (DE-11-09) cruise.
2) Sample adjacent to three drifters released near larval Atlantic herring collections made during the November EcoMon.
3) Retrieve a Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS) buoy that was drifting in Jordan Basin, Gulf of Maine.
4) Collect particle-size distribution profiles at plankton stations using a Laser In-Situ Scattering Transmissometer.
5) Test the use of a new Flouroprobe instrument.
6) Conduct visual survey of historic sea duck hot spots west of Nantucket Shoals.
7) Conduct bongo and neuston survey on three transect lines across sea duck hot spots west of Nantucket Shoals to sample sea duck prey field.
8) Report northern right whale and other marine mammal sightings.
9) Collect SCS and acoustic data, including the EK-60 from along the cruise track.
10) Collect of Pteropod samples for RNA sample material.

METHODS

Plankton and hydrographic sampling was conducted by making double oblique tows using the 61-cm bongo sampler and a Seabird CTD with and without the VPR attached. Bongo net sampling was conducted at a ship speed of 1.5 – 2.0 knots. A mechanical flowmeter was suspended within the mouth of each 61-cm sampler to determine the amount of water filtered by each net. The plankton sampling gear was deployed off the starboard stern quarter of the vessel using an A-frame and a DT winch. Juvenile fish sampling was conducted by making double oblique tows using the 1.8-m IKMT with a Seabird CTD attached to the upper net bar. The ship speed during IKMT towing was 3.0 – 3.5 knots. No flowmeter was attached to the IKMT. The midwater trawl was fished off the stern using the stern A-frame and another DT winch that was placed on the aft deck specifically for this cruise. All tows were made to approximately 10-m above the bottom, or to a maximum depth of 200 m. Tow

depth was monitored in real time with a Seabird CTD profiler. The Seabird CTD profiler was hard-wired to the conductive towing cable, providing simultaneous depth, temperature, and salinity for each plankton and IKMT tow. At Ecosystem processes stations, the bongo frame was fitted with a 335-micron and a 505-micron nylon mesh nets and the VPR was attached below the frame, and acted as the depressor. Standard bongo protocol, a bongo equipped with two 335-micron mesh nets, was used at the EcoMon stations. The bongo fitted with 335- and 505-micron mesh nets was towed at the sea duck prey field stations, but no VPR or IKMT tows were conducted. However, 5-minute neuston tows were made at the historic sea duck hot spots and the stations adjacent to them on the three visual surveys transects. The 61-cm bongo plankton samples were preserved in either a 5% solution of formalin in seawater or 95% ethanol. The neuston samples were preserved in a 5% solution of formalin in seawater. IKMT samples were preserved in 95% ethanol. All ethanol samples were changed once at 24 hours after the initial preservation.

Vertical casts were conducted with a Laser In-Situ Scattering Transmissometer (LISST) to collect particle-size distribution profiles at plankton stations. Casts were made with the LISST, Seabird CTD, and a 1.7-liter Niskin bottle deployed off the starboard stern quarter of the vessel using an A-frame and a DT winch. Sub-surface water samples collected with the Niskin bottle were used for Seabird CTD salinity data calibration and Flouroprobe sampling. The Fluoroprobe is designed to estimate the amount and types of phytoplankton in the water, and this was the first time the instrument was used in the field.

Continuous monitoring of the seawater salinity, temperature and chlorophyll-a level, from a depth of 3.7 meters along the entire cruise track was done by means of a thermosalinograph, and a flow-through fluorometer hooked up to the ship's flow-through seawater system. Data from those instruments and the thermosalinograph, and the fluorometer at 10-second intervals was logged into the Scientific Computer System (SCS). The data records were given a time-date stamp by the GPS unit. Calibration of the flow-through systems CTD salinities and chlorophyll-a of surface waters were undertaken while the ship was underway. Sample analysis for these calibrations followed the protocol outlined in the Ecosystem Monitoring Program Operations Manual.

RESULTS

The *Delaware II* sailed at 1430 hours EDT on Wednesday, 30 November 2011. In total, 71 stations were completed during the cruise, 43 stations were Ecosystem Processes, ten were EcoMon, and eighteen were sea duck prey field stations. A summary of routine survey activities is presented in Table 1. Areal coverage for the cruise is shown in Figure 1. The weather during the cruise was very good for the first week of the cruise. The ship headed out Great Round Shoals channel the afternoon of 30 November to begin operations just off Cape Cod, and allow seas on Georges Bank to subside. The following morning, the ship arrived at the first EcoMon station on the northern edge of Georges Bank. The weather cooperated and the nine EcoMon stations on the bank were completed the morning of 02 December, after which Ecosystem Processes stations were worked on a track towards the drifter stations. The drifters had traveled west off Georges Bank since their release, and were sampled south of the Ambrose Light-Nantucket Traffic Lane. After completing the drifter stations, we decided to take advantage of the calm seas and sample more stations in the eastern Nantucket Shoals region, including the last EcoMon station near Davis Bank. By the afternoon of 04 December we had completed most stations in the Georges Bank and Southern New England regions, finishing in Great South Channel. The ship steamed northeast to Jordon Basin to retrieve the NERACOOS buoy. The ship arrived at the NERACOOS buoy just after midnight 05 December, and the crew was able to secure it onboard after a few hours work. After securing the buoy, the ship transited to the most

northern stations in the western Gulf of Maine. We arrived off the coast of Portsmouth and resumed plankton operations just over 24 hours after completing the last plankton station. The ship worked south the evening of 05 December and early 06 December, sampling stations off Portsmouth and Cape Ann. After finishing the stations line off Cape Ann, the ship steamed towards Provincetown, stopping to sample a station in Cape Cod Bay. A crewmember was transferred to shore via the rescue boat to Provincetown Harbor, prior to resuming plankton operations offshore of Massachusetts Bay. Stations were completed in Cape Cod Bay the evening of 06 December, before transiting through the canal. The plan for 07 December was to conduct combined visual survey / ACROBAT transects west of Nantucket Shoals. We attempted to deploy the ACROBAT off the stern of the ship but aborted operations because swells would have made deployment and retrieval of the instrument too risky. Instead Tim White, the marine mammal / sea bird observer, conducted visual surveys on three lines running east to west. The lines coincide with his long-tailed duck areal survey transects. After visual survey operations were completed, bongo and neuston tows along the three transects were conducted to collect sea duck prey. A nor'easter began impacting the region around midnight 08 December. The winds and seas in the offshore and coastal waters deteriorated rapidly through the night, and operations plankton operations were just after 1:30-am. Winds and seas made sampling the coastal waters unfavorable. We were able to make four comparative bongo / VPR and bongo only tows in Vineyard Sound prior to docking around 2:30-pm 08 December.

Pictures and text were submitted to the Research Communications Branch who posted a blog online. Archives of the blog can be viewed at http://nefsc.wordpress.com/category/ecosystem-processes-research-cruises/**.**

DISPOSITION OF SAMPLES AND DATA

The plankton operations logs and plankton samples collected with the 61-cm bongo, IKMT, and Neuston nets were delivered to the Ecosystem Monitoring Group of the NEFSC, Narragansett, Rhode Island for quality control processing.

The Oceanography Branch of the NEFSC, Woods Hole, retained the CTD data and original log sheets.

Pteropod samples delivered to Amy Maas at WHOI.

The NERACOOS buoy was offloaded from the ship to a University of Maine truck.

SCIENTIFIC PERSONNEL

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Table 1. Summary of sample activities conducted at 71 stations at which the *Delaware II* stopped to lower instruments over the side during Cruise No. DE 11-10, numbered in consecutive station order. Latitude and Longitude are shown in decimal degrees. The primary station objective (Eco = EcoMon, EP = Ecosystem Processes, SD = Sea duck prey field) determined the plankton operations that were conducted. Secondary operations included vertical casts with a Laser In-Situ Scattering Transmissometer (LISST) and Niskin water bottle.

Station	Month	Day	Year	GMT	Latitude	Longitude	Objective	Bongo	VPR	IKMT	Neuston	LIIST	Niskin
1	12	1	2011	1:33:50	41.488	-69.565	EP	1	1	1			
2	12	1	2011	3:09:44	41.583	-69.672	EP	2	2	2			
3	12	1	2011	4:58:27	41.587	-69.533	EP	3	3	3			
4	12	1	2011	7:21:35	41.352	-69.553	EP	4	4	4			
5	12	1	2011	14:19:23	41.513	-68.377	Eco	5		5			
6	12	1	2011	15:36:50	41.588	-68.347	Eco	6		6			
7	12	1	2011	18:48:33	41.327	-68.023	Eco	7		7		1	
8	12	1	2011	21:02:10	41.172	-67.947	Eco	8		8			
9	12	2	2011	1:06:10	41.317	-67.272	Eco	9		9			
10	12	2	2011	4:01:04	40.953	-67.535	Eco	10		10			
11	12	2	2011	8:07:42	40.992	-68.232	Eco	11		11			
12	12	2	2011	10:12:58	40.848	-68.327	Eco	12		12			
13	12	2	2011	12:22:22	40.740	-68.602	Eco	13		13		2	1
14	12	2	2011	15:56:57	40.343	-68.860	Eco	14	5	14		3	2
15	12	2	2011	19:14:59	40.165	-69.253	EP	15	6	15		4	3
16	12	2	2011	21:24:16	40.080	-69.417	EP	16	7	16			
17	12	2	2011	23:02:33	40.080	-69.580	EP	17	8	17		5	4
18	12	3	2011	1:33:53	40.158	-69.848	EP	18	9	18			
19	12	3	2011	6:40:56	40.437	-69.158	EP	19	10	19		6	5
20	12	3	2011	8:33:38	40.415	-69.337	EP	20	11	20			
21	12	3	2011	12:28:45	40.413	-69.850	EP	21	12				
22	12	3	2011	15:00:21	40.665	-69.888	EP	22	13	21			
23	12	3	2011	19:00:01	41.058	-69.710	Eco	23					
24	12	3	2011	20:46:47	40.998	-69.525	EP	24	14	22		7	6
25	12	3	2011	22:45:43	40.905	-69.430	EP	25	15			8	7

Table 1. Continued.

Station	Month	Day	Year	GMT	Latitude	Longitude	Objective	Bongo	VPR	IKMT	Neuston	LIIST	Niskin
26	12	4	2011	1:29:33	40.747	-69.672	EP	26	16	23			
27	12	4	2011	2:32:47	40.745	-69.587	EP	27	17	24		9	8
28	12	4	2011	5:10:24	40.748	-69.255	EP	28	18	25			
29	12	4	2011	6:41:04	40.665	-69.168	EP	29	19	26		10	9
30	12	4	2011	8:57:04	40.832	-68.920	EP	30	20	27			
31	12	4	2011	11:31:17	41.080	-69.165	EP	31	21	28		11	10
32	12	4	2011	14:08:40	41.167	-68.782	EP	32	22	29			
33	12	4	2011	15:16:26	41.165	-68.697	EP	33	23	30			
34	12	4	2011	16:24:45	41.247	-68.668	EP	34	24	31		12	11
35	12	5	2011	17:41:50	43.027	-70.083	EP	35	25	32		13	12
36	12	5	2011	19:17:55	43.027	-70.167	EP	36	26	33			
37	12	5	2011	20:43:11	43.108	-70.167	EP	37	27	34		14	13
38	12	5	2011	22:50:10	43.082	-70.372	EP	38	28	35			
39	12	6	2011	1:04:09	43.055	-70.567	EP	39	29	36		15	14
40	12	6	2011	2:57:02	42.917	-70.620	EP	40	30	37			
41	12	6	2011	5:08:09	42.682	-70.530	EP	41	31	38		16	15
42	12	6	2011	6:18:58	42.682	-70.447	EP	42	32	39			
43	12	6	2011	7:38:24	42.693	-70.255	EP	43	33	40		17	
44	12	6	2011	9:42:13	42.697	-70.087	EP	44	34	41			
45	12	6	2011	14:59:57	42.023	-70.368	EP	45	35	42		18	16
46	12	6	2011	20:23:01	42.362	-70.418	EP	46	36	43		19	17
47	12	6	2011	21:44:10	42.362	-70.498	EP	47	37	44			
48	12	7	2011	1:12:58	41.942	-70.453	EP	48	38	45		20	18
49	12	7	2011	19:05:52	40.872	-70.045	SD	49			1		
50	12	7	2011	19:41:19	40.873	-70.107	SD	50			2		
51	12	7	2011	20:17:02	40.873	-70.147	SD	51			3		
52	12	7	2011	20:53:26	40.873	-70.198	SD	52					
53	12	7	2011	21:20:53	40.875	-70.262	SD	53					

Table 1. Continued.

Station	Month	Day	Year	GMT	Latitude	Longitude	Objective	Bongo	VPR	IKMT	Neuston	LIIST	Niskin
54	12	7	2011	21:54:30	40.873	-70.330	SD	54					
55	12	7	2011	22:26:46	40.873	-70.400	SD	55					
56	12	7	2011	23:15:45	40.953	-70.398	SD	56					
57	12	7	2011	23:50:54	40.952	-70.313	SD	57					
58	12	8	2011	0:19:49	40.952	-70.247	SD	58			4		
59	12	8	2011	0:59:16	40.953	-70.182	SD	59			5		
60	12	8	2011	1:33:54	40.955	-70.113	SD	60			6		
61	12	8	2011	2:27:28	41.035	-70.095	SD	61					
62	12	8	2011	2:58:55	41.038	-70.163	SD	62					
63	12	8	2011	3:40:48	41.038	-70.228	SD	63			7		
64	12	8	2011	4:19:35	41.037	-70.282	SD	64			8		
65	12	8	2011	4:53:51	41.037	-70.333	SD	65			9		
66	12	8	2011	5:29:54	41.037	-70.398	SD	66					
67	12	8	2011	6:16:28	41.060	-70.513	EP	67		46			
68	12	8	2011	15:14:00	41.477	-70.717	EP	68	39				
69	12	8	2011	15:45:38	41.465	-70.735	EP	69	40				
70	12	8	2011	16:00:43	41.465	-70.735	EP	70					
71	12	8	2011	16:26:26	41.477	-70.717	EP	71					

Figure 1. Map of stations occupied during Cruise No. DE 11-10 with the primary station objective (EcoMon, Ecosystem Processes, or Sea duck prey field) for each location.